Appendix "B"

been used since 1948 for the research, development and testing of liquid-propellant rocket engines and associated components. The SSFL site was also used by the Department of Energy (DOE) for nuclear energy research and development and operated several small scale nuclear reactors on-site.

Because of the close proximity of the Centex site to the SSFL site, a radiological survey was included as part of the Preliminary Endangerment Assessment (PEA) Workplan to evaluate radiological conditions at the Centex site.

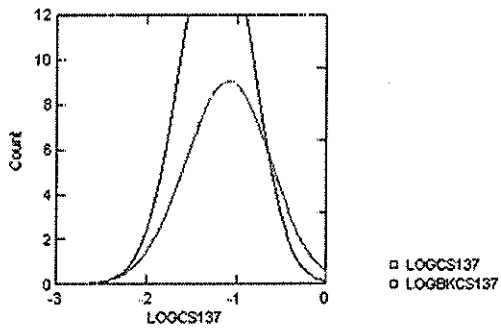
Scope of Review

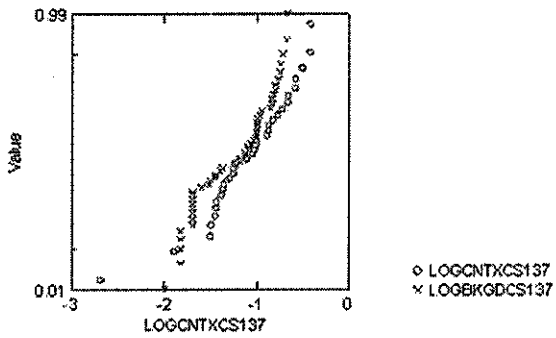
The Radiological Investigation Report for the Centex Homes Site was reviewed for sample collection, analysis, data evaluation and data usability for evaluating current and future potential health risks.

Comments

Page 2, Section 2.0 (Data Review and Evaluation): Table 1 presents the summary statistics for Cs-137, Sr-90, Pu-239/240 and naturally occurring radionuclides. For Cs-137, Table 1 lists the maximum site concentration as 0.58 pCi/g, when the maximum soil concentration is really 0.058 pCi/g (please see the sample results for C-10W in Appendix A). Likewise, Table Three of the introductory section lists the soil concentration of Sr-90 for Sample M-5-N as 0.64 pCi/g, when it is really 0.064 pCi/g. Please review all tables for accuracy against the actual analytical reports and revise all calculations, tables, figures and text accordingly.

The summary statistics presented in Table 1 (Page 3) are the summary statistics for the raw data, which assumes that the data for each radionuclide are normally distributed. Cs-137 for example, appears to be lognormally distributed, as shown by the following density plots and probability plots of the log-transformed data.





Based on the above plots, both the background and site data are lognormally distributed. For background, HERD used the Draft Additional Soil and Water Sampling at the Brandeis-Bardin Institute and Santa Monica Mountains Conservancy prepared by McLaren/Hart and dated 1994. The following table summarizes the background and site data for Cs-137, including the summary statistics.

Background Cs-137 (pCi/g)	Log(Bkd) Cs-137
	-
0.092	1.0362122
0 02	-1.69897
0.02	-1.69897
0.1	-1
0.02	-1.69897
	-
0.158	0.8013429
0.175	-0.756962
	-
0 209	0.6798537
	-
0.18	0.7447275
	-
0.17	0.7695511
	-
0.19	0.7212464
	-
0.03	1.5228787
	-
0.213	0.6716204
0 02	-1.69897
0.025	-1.60206
0.035	-1 455932
0.099	-

Sample Identification	Centex Cs-137 (pCi/g)	Log(Centex) Cs-137
A2-N	0.035	-1.455932
A4-W	0.036	-1.4436975
B5-S	0.128	-0.89279
B7-W	0.0356	-1.44855
E16-W	0.0989	-1.0048037
B15-W	0.05	-1.30103
C4-N	0.0408	-1.3893398
C10-W	0.00201	-2.6968039
D1-N	0.0552	-1.2580609
D2-S	0.167	-0.7772835
D6-W	0.215	-0.6675615
F4-N	0.0127	-1.8961963
G7-S	0.0769	-1.1140737
G9-W	0.15	-0.8239087
G13-W	0.0578	-1.2380722
H5-W	0.0424	-1.3726341
I2-N	0.031	-1.5086383

	1.0043648
0.02	-1.69897
0.02	-1.69897
0.074	1.1307683
0.147	0.8326827
0.1	-1
0.067	1.1739252
0.099	1.0043648
0.101	0.9956786
0.148	0.8297383
0.08	-1.09691
0.1	-1
0.073	1.1366771
0.153	0.8153086
0.158	0.8013429
0.109	0.9625735
0.14	-0.853872
0.059	-1.229148
0.067	1.1739252
0.113	0.9469216
0.015	1.8239087
0.031	1.5086383
0.042	1.3767507
0.04	-1.39794
0.097	1.0132283
0.015	1.8239087
0.01	-2
0.035	-1.455932
0.02	-1.69897
0.085	1.0705811

I4-S	0.217	-0.6635403
I15-W	0.134	-0.8728952
I4-N	0.133	-0.8761484
M5-N	0.31	-0.5086383
M10-W	0.262	-0.5816987
N6-S	0.0889	-1.0510982
N8-W	0.26	-0.5850267
K6-S	0.0316	-1.5003129
K7-N	0.187	-0.7281584
P3-N	0.093	-1.0315171
P6-W	0.0434	-1.3625103
P7-S	0.377	-0.4236586
P9-N	0.055	-1.2596373
R9-W	0.378	-0.4225082
DEBRIS P6	0.0965	-1.0154727

	N	31	31	
	Min	0.002	-2.697	
	Max	0.378	-0.423	0.378
	Mean	0.123	-1.102	0.079
	Std. Dev	0.106	0.479	3.010
	95th Perct	0.3435	-0.4661485	0.342
	98th Perct	0.3774	-0.4231985	0.377

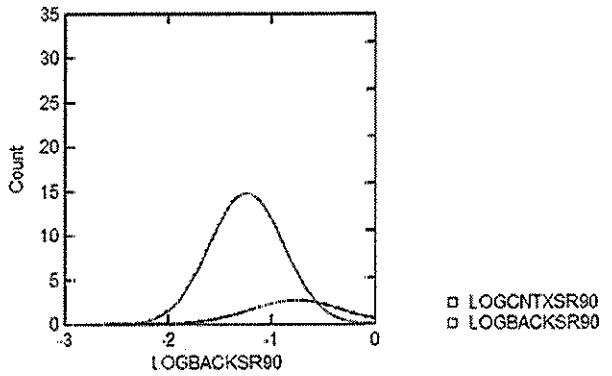
	0.08	-1.09691	
	0.015	- 1.8239087	
	0.02	-1.69897	
	0.015	- 1.8239087	
N	50	50	
Min	0.01	-2	0.01
Max	0.213	-0.672	0 213
Mean	0.08	-1.23	0.05872739
Std. Dev	0.06	0.39	2.44655047
95th Perct	0.1855	- 0.7318129	0.18543304
98th Perct	0.20908	-0.679689	0.20907926

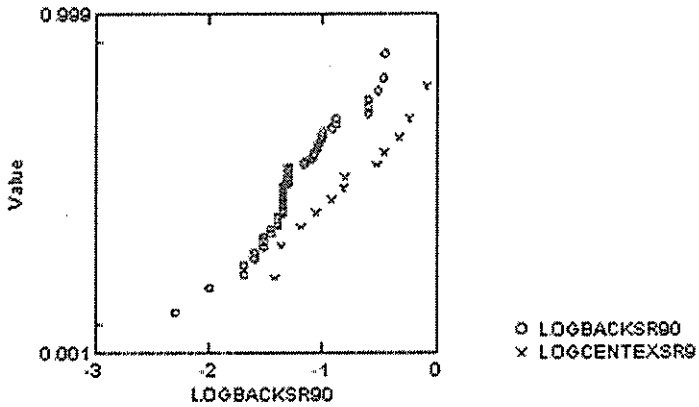
The means of the log-transformed data are 0.08 pCi/g for the Centex site data and 0.06 pCi/g for the background data set, which are essentially the same. Based on the overlap of the two data sets and the variability of the data, there appears to be no real difference between the site and background data sets. As can be seen from the following box plots of the site and background data sets, there appear to be no outliers or elevated soil detections in the Centex site data set.

However, based on the background data, the upper-bound Cs-137 concentration, as represented by the 98th percentile, is 0.21 pCi/g. The Centex data set has seven detections that exceed the background concentration of 0.21 pCi/g. Consequently, in order to determine if these exceedences show any lateral extent that may indicate an

area of potential contamination, HERD recommends step-out sampling in four directions around sample locations D6-W, I4-S, M5-N, M10-W, N8-W, P7-S and R9-W.

As for Cs-137, Sr-90 appears to be lognormally distributed, as shown by the following density and probability plots of the log-transformed data.





The background and site Sr-90 data sets do not appear to overlap well. The means of the log-transformed data are 0.17 pCi/g for the Centex site data and 0.06 pCi/g for the background data set, The following table summarizes the background and site data for Sr-90, including the summary statistics.

Background	Log Back	Centex	Log Centex

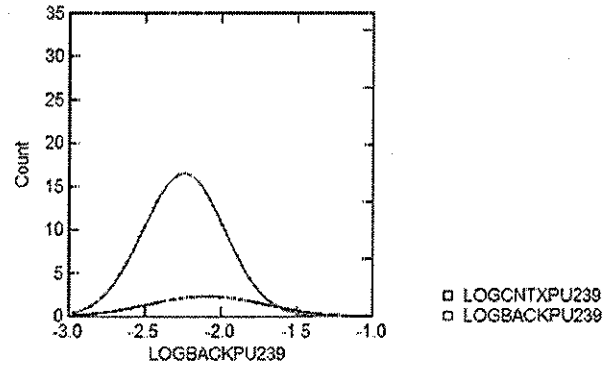
Sr-90 (pCi/g)	Sr-90 (pCi/g)
0.03	1.5228787
0.01	-2
0.045	1.3467875
0 045	1.3467875
0.05	-1.30103
0.04	-1 39794
0.035	-1.455932
0 05	-1 30103
0.05	-1.30103
0.02	-1 69897
0 34	0.4685211
0.13	0.8860566
0.12	0.9208188
0.005	-2.30103
0 04	-1 39794
0 25	-0 60206
0.03	1.5228787
0.13	0.8860566
0.05	-1.30103
0.088	1.0555173
0.08	-1.09691
0.1	-1
0.069	1.1611509
0.097	1.0132283
0.05	-1.30103
0.084	1.0757207
0 098	1.0087739
0 25	-0 60206
0.045	1.3467875
0.045	1.3467875
0 03	-

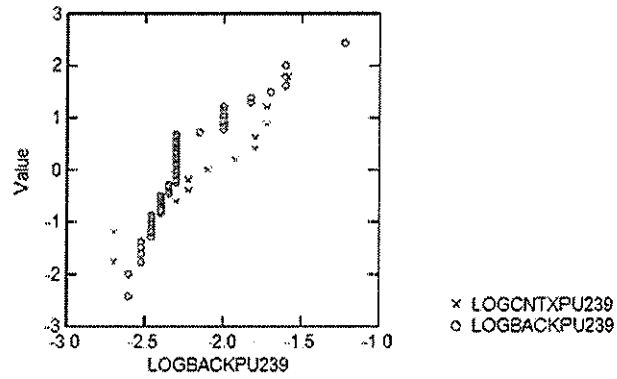
	Sr-90 (pCi/g)	Sr-90 (pCi/g)	
F4-N	0.3	-0.523	
B5-S	0.038	-1.420	
C10-W	0.043	-1.367	
N8-W	0.35	-0 456	
M10-W	0.12	-0.921	
A4-W	0 586	-0 232	
D6-W	0.192	-0.717	
G9-W	0.824	-0 084	
P6-W	-0.586		
G13-W	0 087	-1.060	
R9-W	-0.183		
I4-S	0.47	-0 328	
N6-S	-0.256		
A2-N	0.155	-0.810	
M5-N	0.064	-1.194	
Min	-0.586	-1.420	0.038
Max	0.824	-0 084	0.824
Mean	0.147	-0.759	0.174
Std Dev	0.345	0.446	2.789
95th Perct	0.657	-0.165	0.683
98th Perct	0.757	-0.117	0.764

		1.5228787	
	0 02	-1.69897	
	0.07	-1.154902	
		-	
	0.045	1.3467875	
	0.089	-1.05061	
	0.05	-1.30103	
		-	
	0.305	0.5157002	
		-	
	0.045	1.3467875	
	0 05	-1.30103	
		-	
	0 045	1.3467875	
	0.04	-1.39794	
		-	
	0 045	1.3467875	
		-	
	0 045	1.3467875	
	0.35	-0.455932	
		-	
	0 045	1.3467875	
	0.025	-1.60206	
	0.25	-0.60206	
		-	
	0.082	1.0861861	
		-	
	0.045	1.3467875	
	0 04	-1.39794	
	0.035	-1.455932	
		-	
	0.093	1.0315171	
	0.025	-1 60206	
Min	0.005	-2.301	0.005
Max	0.35	-0.456	0.350
Mean	0.082	-1.237	0.058
Std Dev	0.082	0.357	2.277
95th Perct	0.272	-0.568	0 271
98th Perct	0.339	-0.470	0.339

Based on the background data, the upper-bound Sr-90 concentration, as represented by the 98th percentile, is 0.34 pCi/g. The Centex data set has five detections that exceed the background concentration of 0.34 pCi/g. Consequently, in order to determine if these exceedences show any lateral extent that may indicate an area of potential contamination, HERD recommends step-out sampling in four directions around sample locations F4-N, N8-W, A4-W, G9-W and I4-S. Because the Centex site mean was over two times the background mean, HERD also recommends that the above sample locations be re-sampled, in addition to collecting step-out samples. Finally, because of the discrepancies in detection limits between the site and background data, HERD recommends that at least five off-site background samples be collected at the same time as the site samples.

As for Cs-137 and Sr-90, Pu-239 also appears to be lognormally distributed, as shown by the following density and probability plots of the log-transformed data.





The background and site Pu-239 data sets appear to overlap very well. The means of the log-transformed data are 0.008 pCi/g for the Centex site data and 0.006 pCi/g for the background data set, The following table summarizes the background and site data for Pu-239, including the summary statistics.

	Centex Pu-239/240 (pCi/g)	Log(Centex) Pu-239/240	
F4-N	0.006	-2.222	
B5-S	0.019	-1.721	
C10-W	-0.001		
N8-W	0.019	-1.721	
M10-W	0.016	-1.796	
A4-W	0.006	-2.222	
D6-W	0.005	-2.301	
G9-W	0.008	-2.097	
P6-W	0.012	-1.921	
G13-W	0.026	-1.585	
R9-W	0.004	-2.398	
I4-S	-0.002		
N6-S	0.016	-1.796	
A2-N	0.002	-2.699	
M5-N	0.002	-2.699	
Min	-0.002	-2.699	0.002
Max	0.026	-1.585	0.026
Mean	0.009	-2.091	0.008
StdDev	0.008	0.370	2.345

Background (0.5DL)	Log(Back)
0.005	-2.301
0 005	-2.301
0.005	-2.301
0.005	-2.301
0 005	-2.301
0 005	-2.301
0 01	-2.000
0 0045	-2.347
0.005	-2.301
0 005	-2.301
0.06	-1.222
0 0035	-2.456
0 0035	-2.456
0 0035	-2.456
0.005	-2.301
0.025	-1.602
0 005	-2.301
0.005	-2.301
0.0035	-2.456
0 0025	-2.602
0 01	-2.000
0 003	-2.523
0 005	-2.301
0 01	-2.000
0 005	-2.301
0.015	-1.824
0 0025	-2.602
0 01	-2.000
0 004	-2.398
0.003	-2.523
0 02	-1.699
0 005	-2.301
0.005	-2.301
0.007	-2.155

	0 004	-2.398	
	0.004	-2.398	
	0 01	-2.000	
	0.005	-2.301	
	0.005	-2.301	
	0.025	-1.602	
	0 004	-2 398	
	0 005	-2.301	
	0.01	-2.000	
	0 0045	-2.347	
	0.005	-2.301	
	0.005	-2.301	
	0 005	-2.301	
	0.003	-2.523	
	0 01	-2.000	
	0.0045	-2.347	
	0.015	-1.824	
	0.004	-2.398	
	0 0045	-2.347	
	0.003	-2.523	
	0 01	-2.000	
	0.004	-2.398	
	0 0035	-2.456	
	0 005	-2.301	
	0.005	-2.301	
	0.0035	-2.456	
	0 025	-1.602	
	0.0045	-2.347	
	0.005	-2.301	
	0 0035	-2.456	
	0.004	-2.398	
	0 004	-2.398	
Min	0.0025	-2.60206	0 0025
Max	0.06	-1.22185	0.06
Mean	0.007	-2.245	0.005691
StdDev	0.008	0.267	1.847285 1
95th Perctl	0 024	-1.626	0.023644
98th Perctl	0.025	-1.60206	0.025

Linda S Adams
Secretary for
nvironmental Protection

Department of Toxic Substances Control

Maureen F. Gorsen, Director
1011 North Grandview Avenue
Glendale, California 91201

Arnold Schwarzenegger
Governor

MEMORANDUM

TO: Jose Diaz, Project Manager
California Environmental Protection Agency
Department of Toxic Substances Control
Site Mitigation
Glendale, California 91201

FROM: William S. Bosan, Ph.D.
Staff Toxicologist
Human and Ecological Risk Division
Glendale, California 91201

DATE: **DRAFT**

SUBJECT: Review of the Radiological Investigation Report, Dayton Canyon Site (Centex Homes), West Hills, California.

PCA: 12050 Site: 401144-11

Document Reviewed

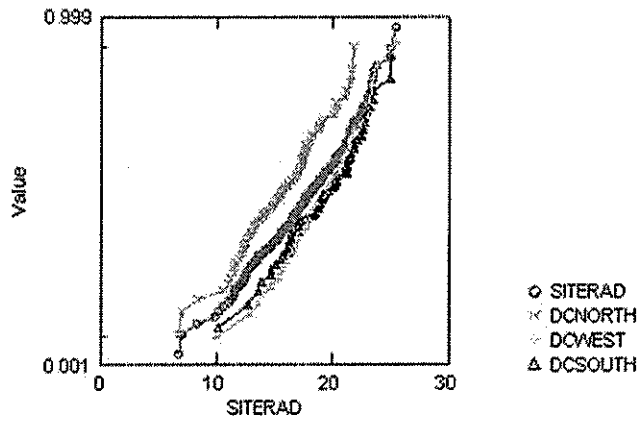
The Human and Ecological Risk Division (HERD) has reviewed the Radiological Investigation Report for the Centex Homes Site, dated June 7, 2006. The IAQ Data Transmittal was prepared by Environ International Corporation, Irvine, California. Comments on the IAQ Data Transmittal are presented below.

Background

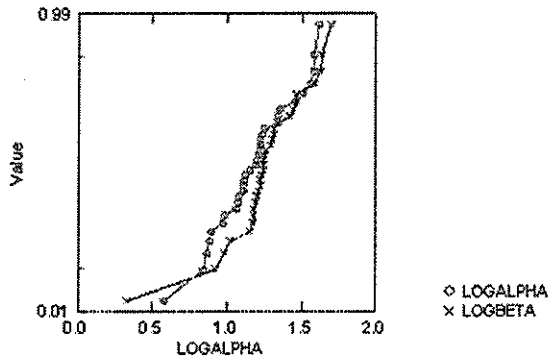
The Centex Sterling Homes Site (Centex Site) is located in West Hills, California and encompasses approximately 100 acres of undeveloped land. The Centex site is located approximately 0.5 miles directly east of the eastern boundary of the Rocketdyne/Boeing Facility, also known as the Santa Susana Field Laboratory (SSFL). The SSFL site has

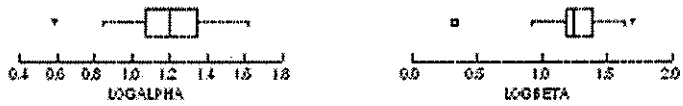
Based on the background data, the upper-bound Pu-239 concentration, as represented by the 98th percentile, is 0.025 pCi/g. The Centex data set has one detection at the background concentration of 0.025 pCi/g. Consequently, in order to determine if this sample has any lateral extent that may indicate an area of potential contamination, HERD recommends step-out sampling in four directions around sample location G13-W.

The following probability plot presents the average levels of radioactivity for the north, south and west areas.



Based on the average results, the DC-West and DC-South data overlap and are almost identical, with the DC-North data appearing somewhat lower. However, the site-wide exposure rates appeared linear and did not show evidence of any outliers. Given the variability of the instrument used and the fact that measurements were taken over a one month period, it is not surprising to see variability over the three areas of Dayton Canyon. Likewise, the gross alpha and beta radioactivity over the entire site do not show any indication of excessive levels or outliers, as can be seen in the following probability and box plots.





Conclusions/Recommendations

Summary statistics should be based on the most appropriate data distribution, for example, if the data are lognormally distributed, log-transformed data should be used. For comparison to background, the local background data as published in the Brandeis-Bardin Institute/Santa Monica Mountains Conservancy Report should be used; please contact the DTSC Toxicologist to discuss further. For the radionuclides of concern, specifically Cs-137, Sr-90 and Pu-239 (those most likely associated with SSFL activities), HERD recommends additional sampling, as discussed in detail in the above comments. If you have any questions or comments, please contact me at (818) 551-2839 or bbosan@dtsc.ca.gov.

Reviewed by: Gerald A. Pollock, Ph.D.
Senior Toxicologist, HERD

Appendix "C"

LABORATORY
QUALITY ASSURANCE PLAN

Sanford Cohen and Associates, Inc.
Southeastern Environmental Laboratory
1000 Monticello Court
Montgomery, AL 36117

Approved By:

Edwin L. Sensintaffar — 5-31-2006
Edwin L. Sensintaffar — Date
Laboratory Director

Cynthia White — 5-31-2006
Cynthia White — Date
Laboratory Manager

Richard L. Blanchard — 5-31-2006
Richard L. Blanchard — Date
Quality Assurance Officer

Sanford Cohen and Associates, Inc.
Southeastern Environmental Laboratory
1000 Monticello Court
Montgomery, AL 36117

QUALITY ASSURANCE PLAN

CONTENTS

Sanford Cohen and Associates, Inc.
Southeastern Environmental Laboratory

1000 Monticello Court
Montgomery, AL. 36117

PURPOSE AND QUALITY ASSURANCE POLICY

Section No: 1.0
Revision No: 5
Effective Date: 5/31/2006
Expiration Date: None

Document Control Number UC

Approved By:

Laboratory Director — Date: 5-31-2006

Quality Assurance Officer — Date: 5-31-2006

List of Affected Pages

Revision Number	Pages Changed In Revisions
1	2
2	1, 2
3	1, 2
4	2
5	1, 2

1.0 PURPOSE AND QUALITY ASSURANCE POLICY

1.1 Purpose

This Quality Assurance Plan (QAP) defines the policies, organization, objectives, functional operations, and the quality assurance and quality control practices designed to achieve the data quality goals for measurements performed in the Sanford Cohen and Associates (SC&A) Southeastern Environmental Laboratory (SEL). It applies to all work performed in the SEL and is intended to ensure that all measurements are valid, scientifically defensible, and of known precision and accuracy.

Specifically, the objectives of the plan are to:

- continually assess the capabilities of the analytical methods to meet the required Data Quality Objectives (DQOs), which include accuracy, precision, representativeness, completeness, and comparability
- establish and monitor the ongoing operational performance of laboratory instruments and equipment through appropriate system checks
- run audits of standard samples for evaluation of laboratory performance and participate in collaborative test programs to achieve and maintain consistent levels of quality
- perform corrective actions when necessary

The SEL Plan is based on requirements set forth in the National Environmental Laboratory Accreditation Conference (NELAC) Quality Standards, the U.S. EPA's QA policy (QAMS-005/80, revision 4, Dec 29, 1980), EPA QA/R-5, and the Department of Energy Quality Systems for Analytical Services. This Plan provides the overall structure, contents, and requirements for all measurement programs conducted at the SEL. Individual projects may, as necessary, be supported by a Quality Assurance Project Plan (QAPP) that will cover all areas and satisfy all requirements in this SEL Plan but may contain different measurement and evaluation criteria.

1.2 Policy

The SC&A QA policy requires that all radiation measurements produce data of known and specified quality. The purpose for which the data are collected dictates the level of quality that is considered satisfactory, and the excessive use of time and resources on unjustified QA activities is discouraged. However, in no case should QA be considered optional or be ignored.

Each project shall include sufficient quality assurance to produce and document adequate, valid data without the expenditure of unnecessary resources. The SC&A Project Manager shall specify the quality of data required for each measurement program under his/her direction.

It is the absolute policy of the Laboratory to: 1) conduct all laboratory operations in accordance with the highest ethical standards; 2)develop and adhere to principles of good laboratory practice; 3) consistently use standard operating procedures; 4) establish and adhere to carefully designed protocols for specific measurement processes; 5) use qualified and trained personnel, reliable and well-maintained equipment and instruments, and appropriate calibrations and standards; and 6) closely and continuously monitor all laboratory operations. Laboratory policy mandates the use of standards traceable to the National Institute of Standards and Technology (NIST), when available. Radionuclide standards will be acquired from NIST or other reliable sources of NIST-traceable radioactive standards.

All laboratory personnel are expected to perform their duties and conduct themselves in a manner that will avoid even the appearance of unethical behavior. This includes the conduct of all tasks and in the written and electronic documentation of these tasks. Employees are expected to report any such actions on the part of other employees to the Laboratory Director.

Sanford Cohen and Associates, Inc.
Southeastern Environmental Laboratory

1000 Monticello Court
Montgomery, AL 36117

QUALITY ASSURANCE ORGANIZATION AND RESPONSIBILITIES

Section No: 2.0
Revision No: 7
Effective Date: 1/03/2006
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Document Control Number UC

Approved By:

Edwin L. Cohen Jaffe
Laboratory Director

1-03-2006
Date

Quality Assurance Officer

1-03-2006
Date

List of Effective Pages

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5	12
6	1, 2, 3, 8, 10, 12
7	All pages

2.0 QUALITY ASSURANCE ORGANIZATION AND RESPONSIBILITIES

The following section describes the operational and functional responsibilities of key corporate and laboratory personnel, in the quality assurance process for the SC&A Southeastern Environmental Laboratory. Detailed resumes of the key individuals are available upon request.

Vice President, Laboratory Director

To assure that the laboratory achieves all QA program objectives on a continuing basis, the Vice President, Laboratory Director(LD) monitors and directs the quality activities of all QA functions and laboratory staff. With input from the laboratory staff, including the QA Officer (QAO), the LD establishes laboratory policies and practices. The LD has the responsibility to assure the laboratory is compliant with the QA Plan and/or QAPP. The LD reports directly to the corporate Chief Operating Officer (COO). The LD and the QAO are responsible for overseeing QA of all laboratory operations and have the authority to terminate nonconforming work at any time. Additional duties include:

- monitoring the QA program as documented in the QA Plan and ensuring that all elements are performed as written
- reporting to the COO on the effectiveness of the QA program
- developing and implementing new and additional QA programs and operational and evaluation procedures
- maintaining current documentation of all measurement procedures used in the laboratory
- maintaining current methodology and instrumentation

- having final authority to terminate or alter any incorrect or improper analytical or measurement procedure in order to conform to the QA Plan
- overseeing the training and qualification of personnel in specific procedures
- assuring that all documentation on matters relating to analyses and QA is complete and accurate

Quality Assurance Officer

The QA Officer (QAO) reports to the LD and is directly responsible for the continuing operation of the QA program. The QAO is organizationally and functionally independent of all personnel directly involved in the laboratory operations in regard to QA matters. The QAO is primarily responsible for overseeing and directing the QA activities. The QAO is responsible for approval of data based on the accompanying QA results.

Additional duties include:

- providing QA reports to laboratory management
- overseeing the laboratory's participation in external QA/QC programs
- coordinating external and internal QA/QC audits
- reviewing laboratory QA data
- evaluating noncompliance and corrective actions
- providing training to laboratory staff
- verifies the concentration and purity of standards and tracers
- validating new chemical methods prior to their inclusion as an SOP

- maintaining the QA Plan and reporting to management on the need for changes
- conducting scheduled or unannounced audits and inspections, reporting findings to management and assuring that any necessary corrective action is taken
- having final authority to terminate or alter any incorrect or improper analytical or measurement procedure to conform with the QAP and/or QAPP
- training, directing, and qualifying personnel in specified laboratory QC and analytical procedures
- certify the proficiency of laboratory personnel in laboratory procedures and SOPs and the maintenance of the appropriate records
- reviewing client problem resolution reports for out-of-control events and verifying that remedial action is taken to restore control
- ensuring that the laboratory meets all quality requirements as documented in QA Plans and SOPs
- auditing work in progress of quality and completeness
- enforcing good laboratory practices within the laboratory
- reviewing and approving performance evaluation (PE) data
- assuring traceability of all standards
- assuring that all routine calibration checks are taking place

Laboratory Supervisor / Manager

The Laboratory Supervisor / Manager (LSM) directs the analytical staff and processes. He/she reports to the LD and has the responsibility to ensure that all procedures and SOPs, including those that relate to data quality, are in place and being followed.

Additional duties include:

- ensuring adherence to analytical methodology and instrumental procedures
- verifying the proper operation and maintenance of all instruments and equipment
- notifying the LD and QAO of known or suspected QA nonconformance
- investigating the causes of nonconformance and reporting the results of the investigation to the LD
- providing data to the QA Officer that is necessary for certifying or recertifying laboratory personnel, validating new chemical methods and verifying standard/tracer concentration and purity
- overseeing the preparation of reference materials, standards and tracers
- working with the QAO and Senior Analytical Chemist to develop new analytical procedures and methods
- identifying, documenting, and performing corrective actions
- assuring the adequacy of the laboratory staff training
- assuring that laboratory staff follow good laboratory practices
- reviewing all laboratory and QC data to ensure project requirements and criteria are met

- working with the Project Manager to attempt to resolve any client concerns relative to QC
- assuring that all instruments are calibrated according to the listed schedule
- scheduling routine maintenance of equipment and instruments
- serves as the Acting Laboratory Director during absences of the LD

Project Manager

The Project Manager (PM) is responsible for the conduct and performance of the project he/she manages. The PM responsibilities include the preparation of Quality Assurance Project Plan (QAPP) and, working through and with the QA and laboratory staff, adherence to the requirements of the QAPP. The PM is the interface with the client in regards to laboratory and QA matters.

Additional duties include:

- performing data review to evaluate QC acceptance criteria and verify client and contract compliance
- working with QA and laboratory staff to ensure compliance with project and QA objectives
- serving as the lead in resolving client's concerns
- assuring that any corrective actions which were necessary were performed, and that they produced compliant results
- at project initiation, briefing QA and laboratory staff on project methodology and QA requirements
- confirming that laboratory staff are adequately trained and certified to perform on the project

Senior Analytical Chemist

The Senior Analytical Chemist is an Analytical Chemist with the same duties as shown in the section below with additional responsibilities that include:

- serve as the Acting Laboratory Supervisor/Manager during the absence of the LSM
- assists with the development and testing of new and modified laboratory procedures
- provides training for other analytical chemists and technicians in laboratory procedures and SOPs
- certify the proficiency of laboratory personnel in laboratory procedures and SOPs
- monitor intra laboratory quality control to assure compliance with quality criteria
- assure compliance of laboratory with established SOPs and safety plans
- monitor laboratory supplies and assure adequacy of stock
- prepare and maintain reference materials, standards and tracers

Analytical Chemists

The duties of the Analytical Chemists include the following.

- maintain certification for methods and SOPs
- prepare all chemicals, reagents, and standards as required by SOPs
- be proficient and knowledgeable of methods and SOPs for which they have certification
- comply with all laboratory safety requirements
- perform sample and QC sample analysis in accordance with SOPs

- review data to assure compliance with all applicable criteria
- utilize the Laboratory Information Management System (LIMS) to manage analytical data

Data Reporting and Delivery Officer

The Data Reporting and Delivery Officer is responsible for assuring that the Contractor receives the data reports in a timely manner and that they are consistent with the contract requirements.

- leads efforts to clarify reported data to the client as needed
- coordinates efforts; with the Laboratory Manager, Quality Assurance Officer, and Project Manager, within the Laboratory to develop, interpret, and transmit data packages
- coordinates the submission of electronic deliverables

Systems Manager

The Systems Manager is responsible for the proper operation and maintenance of the data processing and sample tracking systems. Duties include:

- assurance that data integrity and security are maintained within Laboratory systems
- assure that all system software is properly validated and maintained
- verification of personnel training and competency on systems

Sample Custodian

The Sample Custodian is responsible for all aspects of sample management including maintaining legal custody of samples after receipt at the laboratory. The Custodian insures that samples remain under chain-of custody throughout the analytical process. The Custodian is responsible for receiving, scheduling analyses, and disposal or return of samples to the client.

Duties include:

- receives samples, evaluates and records the condition of samples, checks preservatives, and screens for radionuclide contamination
- compares information contained on the chain-of-custody to that which is on the sample containers.
- maintains supply of sample bottles and preservatives
- assigns laboratory sample numbers, prepares bench sheets, and schedules analyses
- maintains samples according to chain-of-custody requirements
- archives samples according to project requirements
- returns samples to client after analyses are completed or schedules their disposal
- prepares shipping credentials

Radiation Safety Officer

The Radiation Safety Officer (RSO) is responsible for administering the Laboratory's radiation safety program in compliance with the State of Alabama regulations, the conditions of the Radioactive Materials License, and the SC&A Radiation Safety Manual for Laboratory Practices. Duties include:

- provide annual radiation safety training and copies of all radiation safety related material to all employees involved with the use, handling, and/or analysis of radioactive materials
- disseminate and collect personnel dosimeters
- provide a means to safely store radioactive materials, instruments, personnel dosimeters, and related equipment

- ensure that all portable survey instruments assigned to the RSO are maintained in effective operating condition and calibration at all times
- implement, direct and supervise radiological monitoring activities at the Laboratory
- process all Radioactive Materials License applications, amendment requests, and program updates
- monitor radiological practices at the Laboratory to assure regulatory compliance
- process procurement requests for radionuclides and radioactive materials
- receive all shipments of radionuclides, equipment, and other radioactive materials and deliver or supervise delivery to the individuals named on the purchase request
- perform quarterly reviews of employee exposure records (dosimetry measurements) and laboratory survey records (external exposure measurements)
- maintain exposure records on employees and make such data available to workers
- in consultation with the Laboratory Director, restrict or terminate hazardous or potentially hazardous radiological operations
- conduct a continuous program of radiation hazard recognition, evaluation, and elimination
- perform quarterly laboratory surveys that include recording contamination levels, smear locations and counts, and any significant exposure rates that may exist in labs using radioactive materials
- supervise all radioactive waste disposal operations at the Laboratory
- designate radiation areas, surface contamination areas, airborne radioactivity areas, and radioactive materials storage areas in the laboratory and install appropriate warning signs,

caution signs, labels, signals, and controls

- supervise decontamination of personnel, areas, and equipment involved in radiological accidents
- assure that protective clothing and equipment are available for all radiation personnel
- assure that all activities within the Laboratory are performed in accordance to established ALARA principles
- inform the Laboratory Director on the operation of the radiological safety program, including any deviations from established SOPs or policy

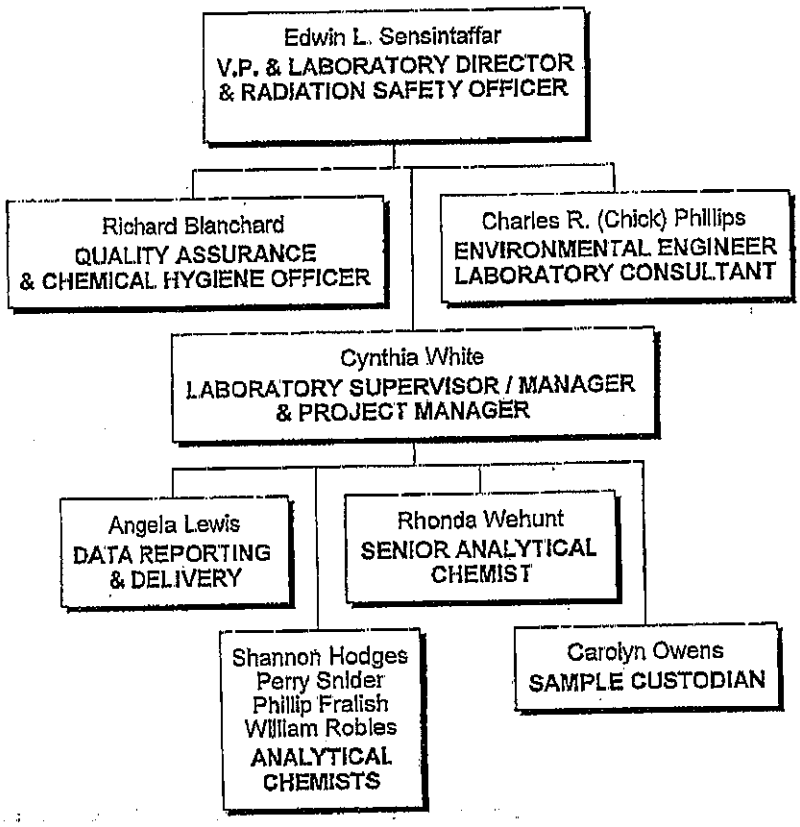
Chemical Hygiene Officer

The Chemical Hygiene Officer's responsibilities include the following duties.

- develop and implement the Chemical Hygiene Plan
- review the Chemical Hygiene Plan annually and update as needed
- maintain an inventory of the chemical products and radionuclides in the laboratory
- collect a Material Safety Data Sheet (MSDS) for each item on the inventory and place in a binder that is accessible to all employees
- label the chemical products if they are not labeled
- train laboratory employees to comply with OSHA's Laboratory Standard and Hazard Communication Standard
- in consultation with the Laboratory Director, restrict or terminate hazardous or potentially hazardous operations
- conduct a continuous program of hazard recognition, evaluation, and elimination

- supervise all chemical waste disposal operations at the Laboratory
- maintain safety training records for each employee
- maintain accident records

SC&A Southeastern Environmental Laboratory
Organization Chart



Sanford Cohen and Associates, Inc.
Southeastern Environmental Laboratory

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Montgomery, AL 36117

TRAINING AND CERTIFICATION

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Edwin L. Sanford
Laboratory Director — 7-28-2006 Date

Richard L. Blanton
Quality Assurance Officer — 7-28-2006 Date

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1	1
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3	1
4	1 and Appendix A
5	1

3.0 TRAINING AND CERTIFICATION

It is the SC&A policy that all laboratory procedures be performed by personnel who are qualified, thoroughly trained, and that their proficiency be documented through certification. Prior to the conduct of any laboratory work, certification must be obtained according to the SOP SCA-201 (see Section 14.0) The certification must be validated annually. The Quality Assurance Officer is responsible for the certification of the analyst and the maintenance of the training and certification records. Further, all employees will be initially trained and, periodically, advised of their responsibility for performing their duties in a manner that is unquestionably ethical and in all respects legal. A copy of the Laboratory's "Policies of Ethical Conduct and Integrity" is included in the handout provided each new employee.

Initial training and annual employee training in radiation safety and laboratory health and safety will be conducted. Initial training will cover subjects that are described in the SEL Radiological Safety and Chemical Hygiene Plan. Annual employee training will emphasize routine laboratory safety issues and will discuss changes that were implemented in the Radiological Safety and Chemical Hygiene Plan in the past year. Training documentation of radiation safety and laboratory health and safety will be maintained in the Quality Assurance Files and individual employee files. Any QA training will be announced, a course outline developed, and a attendee sheet signed. These documents will be maintained in the Quality Assurance Files and in individual employee files. Periodically, training files will be reviewed by the Quality Assurance Officer or the Laboratory Manager.

Training on maintenance of good laboratory practices and laboratory quality will be provided annually. This training session will emphasize ethical conduct, legal responsibilities, good laboratory technique, procedural changes, and performance evaluation. The training on ethical conduct and legal responsibilities will include potential punishments and penalties. Documentation of training will be maintained in the Quality Assurance Files and individual employee files. This documentation will include SCA Form 3-1, "Demonstration of Capability Certification Statement" (see Appendix A) and SCA Form 201-1, "Laboratory Qualification Record".

Periodically the laboratory will present training sessions on the disposal of laboratory waste. These training sessions will be conducted as needed to insure that laboratory waste streams are maintained at a minimum, and that waste products are properly prepared, labeled, and stored for disposal.

APPENDIX A

Demonstration of Capability
Certification Statement
SC&A Southeastern Environmental Laboratory
1000 Monticello Court
Montgomery, Alabama 36117

Date: _____
Analyst Name: _____
Matrix: _____
Method, SOP SCA-____, and Analyte: _____

We, the undersigned, CERTIFY that:

1. The analyst identified above, using the cited test method, which is in use at this facility for the analyses of samples under the National Environmental Laboratory Accreditation Program, has met the Demonstration of Capability.

2. The test method was performed by the analyst identified on this certification.

3. A copy of the test method and the laboratory-specific SOPs are available for all personnel on-site.

4. The data associated with the demonstration capability are true, accurate, complete, and self-explanatory.

5 All raw data (including a copy of this certification form) necessary to reconstruct and validate these analyses have been retained at the facility, and that the associated information is well organized and available for review by authorized assessors.

Technical Director's Name and Title	Signature	Date
Quality Assurance Officer's Name	Signature	Date

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GENERIC QUALITY ASSURANCE PROGRAM

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5	7,8
6	7,8

4.0 GENERIC QUALITY ASSURANCE PROGRAM

The basic measurement requirement is to produce scientifically valid, defensible data of known and specified precision and accuracy. The quality of data is defined in Data Quality Objectives (DQOs) by the Project Manager having oversight and primary responsibility for the project. The DQOs are the most important part of the QAPP, because they relate the exact requirements of the project for the measurement data. DQOs may be described in terms of the following measures:

1) Precision: Precision describes the ability to obtain the same result on repeated measurements. It is expressed in terms of standard deviations, percentage points, or the units of the measurement. The precision objective will vary over different concentration or quantity ranges. The QAPP should specify the amount by which replicate measurements may differ and still be acceptable. Default acceptance criteria are specified later in this section.

2) Accuracy: Accuracy describes the ability to obtain the true result. Accuracy is generally expressed as a percentage or in the units of the measurement, and varies as a function of concentration or quantity. The QAPP should provide the permissible disagreement between a measurement of a standard and the "true" value of that standard. Default acceptance criteria are specified later in this section.

3) Completeness: Completeness describes the number or fraction of the measurements or samples collected which yield useable data. The QAPP must specify the degree of completeness required.

4) Representativeness: Representativeness refers to the extent to which the material on which measurements are made represents the material on which judgements are to be made. This QA Plan refers to laboratory activities only. If SC&A is involved in sampling operations, a separate QAPP covering the sampling procedures will be developed. In the laboratory, obvious irregularities (e.g., stones or sticks in a soil sample) should be rejected, and bulk samples should be thoroughly mixed.

5) Comparability: Comparability refers to the kinds of measurements and the units in which the results are expressed. Each QAPP must specify the units in which results are to be reported. Results should be reported in a standard form and expressed clearly. For example, "pCi/kg" is ambiguous, but "pCi/kg dry weight"

is unambiguous. To achieve optimum comparability, the QAPP should specify acceptable methods for collecting and preserving samples, sample holding times, and sample analyses, either by identifying approved procedures or by specifying in detail the performance requirements, acceptable procedures, and documentation needed for alternative methods.

In the absence of a specific QAPP, the SEL will operate under the procedures and criteria defined in this generic plan. SOPs contained in Section 9.0 define the operations performed in the SEL Laboratory.

Upon arrival at the SC&A Laboratory each sample is identified by a unique sample number. For each sample, SC&A records the following items of information:

- Sample number
- Project code (prefix)
- Sample matrix
- Collection date(s) and time(s)
- Sampling location
- Date of receipt at SC&A
- Name of Project Coordinator (reportee)

For each radiochemical analysis, SC&A records the following information:

- Analysis type
- Analyst
- Counting system(s)
- Counting date(s), time(s), and duration(s)
- Verifier initials and verification dates
- Results

For each analytical result, the following information is recorded:

- Name of analyte

- Measured activity, concentration, or amount
- Estimated 2-sigma uncertainty of the measurement
- Units of measurement
- Effective date of measurement

It is SC&A policy to require two *independent* verifications of each radiochemical analysis performed. The first verification typically is done by a representative of the radioanalysis laboratory, and the second by the analyst (if appropriate) or other data evaluator. Further review by the Laboratory Manager and QA Manager verify QA and contract compliance.

The initials of the verifier and the date of verification are recorded with each analysis. The first verification may be based on paper copies of the analysis results before they are stored in the database, but at least one verification must be based on the stored values. Unverified results must not be released.

When a printed report of the analytical results for a project is prepared, the Project Coordinator must review and approve all the data, including the results of QC analyses. The Project Manager and Laboratory Manager must approve any printed report before release. Analytical results, even "verified" results, must not be released to the client without approval.

It is SC&A policy to compute and record all analytical results, whether positive, negative, or zero, along with the associated 2-sigma measurement uncertainties. Negative values and their uncertainties may be included in data reports for scientific readers.

4.1 Internal Quality Control Checks and Frequency

Three types of internal quality control samples are analyzed routinely in the SC&A radiochemistry QA program. The QC analyses and their frequency of use are:

- Laboratory Control Sample (LCS) counting a known quantity of each analyte of interest added to a blank media (one per analysis batch)

- Laboratory Duplicate (LD) a replicate analysis of a sample or, in some cases, an LCS (one per analysis batch)

- preparation blanks (PB), which contain only the radioactive tracer, if appropriate, and reagents used in the analysis (one per analysis batch)

- When called for matrix spikes (MS) may be run with each sample batch.

An analysis batch consists of at most 20 samples of a given matrix, excluding QC samples.

At the discretion of the Project Manager and Laboratory Manager, the quality control frequency can be amended. This action should be documented in writing and notification sent to the Regional Manager.

The result of a quality control check is a quality indicator, whose numerical value must be judged either acceptable or unacceptable. The acceptance criteria for a quality indicator must be based on sound statistical principles and should be formulated in terms of the estimated uncertainties and analytical errors (standard deviations) of the quantities used to compute the value of the indicator.

A quality indicator may have both control limits and warning limits. When an indicator value falls in the warning region, the QA Manager must initiate an investigation. When the value is outside the control limits, corrective action is required (see Section 6.0).

4.2 Data Quality Indicators for Quality Control Analyses

4.2.1 Bias of LCS and MS Measurements

A Laboratory Control Sample (LCS) is analyzed with each batch of samples. An LCS consists of distilled/deionized water spiked with a known quantity of the radionuclide of interest. The source of the radioactivity shall be a NIST certified standard and different from the source used for calibration. The LCS is analyzed and treated in the exact same manner as the unknown samples. The measured concentration of the LCS must be within 0.75 to 1.25 of the known concentration. The measured concentration of a MS, once the original sample concentration is subtracted, shall be within 60% to 140% of the known (added) concentration.

4.2.2 Precision of Laboratory Duplicate Measurements

The acceptability criterion for precision of laboratory duplicate measurements will be based on the following.

$$F = |S - R|$$

$$E = \sqrt{(\sigma_S)^2 + (\sigma_R)^2}$$

where:

F	=	The absolute difference of the sample and duplicate activities
S	=	Original sample activity
R	=	Duplicate sample activity
E	=	Propagated uncertainty of difference
σ_S	=	Total uncertainty of the sample activity
σ_R	=	Total uncertainty of the duplicate activity

The precision is considered to be acceptable if $F/E \leq 3$.

4.2.3 Assessment of Measurement Completeness

As previously described, quality assurance samples will be analyzed concurrently with actual samples on a minimal 1 in 20 basis. The results of these samples will be assessed as described above to provide assurance that each batch of sample data meets the previously defined criteria for precision and accuracy. Quality control sample measurement results will be additionally evaluated to ensure overall adherence of systems and methods to data quality objectives. The procedures and principles to be used in assessing accuracy and precision have been previously discussed.

For some projects additional consideration of certain other site-specific criteria may be relevant and appropriate. In particular, in some instances, the following "completeness" criterion may be of interest:

$$\%Completeness = 100\% \; x \left(\frac{v}{n} \right)$$

where:

v	=	Number of valid measurements
n	=	Number of measurements requested

The general acceptance criterion to be applied for completeness is 90%. However, when noncompliance with the criterion is due to a small number of samples (<20) associated with a project, or the incomplete sample(s) are unimportant to the conclusions to be drawn from the results, the Project Manager may decide to accept the completed data as sufficient.

4.2.4 Preparation Blank Assessment

Preparation blanks will be performed for each of the methods and matrices applicable to each batch of samples.

A preparation blank will be judged acceptable if:

- the MDA of the Batch Blank is less than or equal to the RDL unless all samples in the batch are positive, as defined by the Site;
- if all sample results in the Batch are greater than the Required Detection Limit (RDL), then the Batch Blank MDA shall be less than the activity of the least active sample in the Batch of that sample; and
- if all of the samples in the batch are less than the RDL, the activity of the Blank shall be less than or equal to the RDL.

4.2.5 Total Uncertainty

The total uncertainty of a measurement is calculated as follows:

$$\sigma_T = \sqrt{\sigma_c^2 + \eta^2 A^2}$$

where:

σ_T = the total uncertainty associated with an analysis
σ_c = the counting uncertainty
η = an analysis specific and activity dependent factor for uncertainty
A = the concentration of the radionuclide in the sample (Units for A, σ_c, and σ_T must be identical, e.g., pCi/L or pCi/g.)

The values of the parameter η will be the following:[B]

Analysis	Nuclide	η
Alpha	Alpha	0.25
Am	Am-241	0.10
Beta	Beta	0.15
Gamma	Ba-140	0.05
Gamma	Co-60	0.05
Gamma	Cs-134	0.05
Gamma	Cs-137	0.05
Gamma	I-131	0.05
Gamma	K-40	0.05
H-3	H-3	0.10
C-14	C-14	0.10
I-129	I-129	0.10

Analysis	Nuclide	η
I-131	I-131	0.10
Pb	Pb-210	0.05
Po	Po-210	0.10
Pu	Pu-238	0.10
Pu	Pu-239	0.10
Ra-224	Ra-224	0.10
Ra-226	Ra-226	0.15
Ra-228	Ra-228	0.15
Total Radium	Ra-226/Ra-224	0.25
Rn-222	Rn-222	0.10
Ni	Ni-63	0.10
Sr	Sr-89	0.05
Sr	Sr-90	0.05
Tc-99	Tc-99	0.10
Th	Th-227	0.10
Th	Th-228	0.10
Th	Th-230	0.10
Th	Th-232	0.10
Np-237	Np-237	0.10
U	U-234	0.10
U	U-235	0.15
U	U-238	0.10

(a) η values were generated by Dr. Keith D. McCroan, National Air and Radiation Environmental Laboratory, U.S. Environmental Protection Agency, Montgomery, Alabama, personal communication.

4.2.6 Chemical Yield

The chemical yield of an analysis, as determined by the addition of a known quantity of a radioactive tracer shall be between 30% and 110% and for stable carriers it shall be between 40% and 110%[1].

4.2.7 Assessment of Negative Value

If the sum of a negative value and its (positive) 3-sigma uncertainty is a negative value, it should be documented in the case narrative of the data report. If this is occurring at a rate greater than can be attributed to random causes, a corrective action should be initiated.

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PERFORMANCE AND SYSTEM AUDITS AND FREQUENCY

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2	1, 2
3	1, 2
4	1,2

5.0 PERFORMANCE AND SYSTEM AUDITS AND FREQUENCY

Specific routine and planned audits are conducted of laboratory operations yearly to assess accuracy, completeness of data, to ensure that all required records are kept in a satisfactory and understandable fashion, and to assure that good laboratory practices are followed.

- Routine internal audits are conducted of each major element of laboratory operations yearly. These audits are conducted as specified in SCA-104, Conduct of Internal Audits.

- An annual quality assurance audit is conducted to review the Laboratory Quality Assurance Plan. Additionally, results of all performance evaluation samples will be reviewed.

- SC&A participates in the performance evaluation intercomparison study conducted by the DOE, the Mixed Analyte Performance Evaluation (MAPEP) Quality Assessment Programs, and a program certified by the National Voluntary Laboratory Accreditation Program and operated by Environmental Resource Associates® (ERA).

  These programs supply samples of soil, water, air filters, and vegetation for analyses, that include gross alpha, gross beta, gamma, strontium-89/90, plutonium-238/239, americium-241, uranium-234/238, tritium, nickel-63, technetium-99, and radium-226/228.

PE samples are processed, through all steps, as routine samples with no special attention or care. The results are reported as specified by the conducting agency.

5.1 QA Reports to Management

The results of all PE samples, the reports indicated above, and the results of all internal and external audits are reviewed by the Quality Assurance Officer (QAO), Laboratory Supervisor, Laboratory Manager, and the Laboratory Director.

5.1.1 The Quality Assurance Officer, in concert with the Laboratory Supervisor, investigates the root cause of any failed PE sample analysis and prepares a report to the Laboratory Director, containing the suspected cause of the failure, recommended corrective actions, and the results of the corrective actions that were taken. The same procedure and reporting is conducted when a PE sample result for an analyte that is listed in the laboratory's inventory is not reported by the laboratory to the PE program management. The latter would also include the reason the result was not reported.

These reports by the QA Officer concerning PE sample results become a part of the official record of the MAPEP or RAD Report and are filed in the QA Office.

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CORRECTIVE ACTION

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6.0 CORRECTIVE ACTION

Failure to complete a process, meet criteria related to quality assurance, or those requirements contained in the applicable statement of work (SOW), result in the need to take corrective actions. Corrective actions are documented (SCA Form 6-1, Appendix A) so that the cause of the failure can be ascertained by interested parties, including the laboratory Quality Assurance Officer.

During the processing of samples, as with any process, events occur which render the process invalid or prevent the continuation of the process, e.g., sample spillage. When this occurs, the processing of that entity stops and the process reinitiated, i.e., a corrective action is taken.

With all samples there are criteria established which must be met so the data generated are useable for their intended purpose. Likewise, the quality assurance samples processed concurrently with the samples have acceptance criteria and, usually, prescribed corrective actions. The governing criteria and prescribed corrective actions are contained in the SOW for the samples being processed or in the laboratory generic quality assurance plan (QAP Vol I, Section 4.0). When these established criteria are not met, corrective action is required to be taken and documented.

The corrective action process is initiated by the individual who detects or observes the failure. This failure is noted on SCA Form 6-1 along with the name of the initiating individual and the date. A tracking number, consisting of the type of analysis, analytical batch number, and month/day/year. (For example: Pu-1000-10/07/02.) The reason for the corrective action is indicated by checking the appropriate boxes on Form 6-1. If the individual has a recommended or prescribed corrective action, he/she so indicates it on the form. The form is passed to the Laboratory Supervisor, Project Manager, Laboratory Manager, or Quality Assurance Officer for approval. If the initiator has no recommendation, the approving party provides one. In some cases the corrective action to be taken is dictated by the applicable SOW or the generic quality assurance requirements of QAP Vol I, Section 4.0.

The corrective action is then taken to overcome the failure. Once the corrective process has been successfully completed, the results are so indicated on Form 6-1. If it could be determined, the root cause of the failure should be noted in the "Results of 1st Corrective Action." If the corrective action was unsuccessful in resolving the problem, a second corrective action may be taken and documented on the Corrective Action Form.

Once the root cause is identified as a systemic problem, the SOP which relates to the cause should be modified to prevent the failure in the future. In some cases there could be a requirement to write a new SOP to cover the failure and corrective action. Once the SOP is modified or written, training will be provided to the appropriate staff members on the changes.

If the failure it of sufficient magnitude to warrant, the client whose results have been affected should be notified. If the failure only affects a limited amount of data, it can be covered in the

data package case narratives.

The corrective action is tracked manually by the Laboratory Manager and all documentation concerning the corrective action is filed in the "Corrective Action Logbook." Copies may also be filed with the data package for the sample(s) affected by the corrective action.

A guide to assist in determining when corrective action is required and the appropriate corrective action to take is included.

6.1 MINOR DEVIATIONS FROM SOPs

In the processing of samples it is sometimes necessary to deviate from written SOPs. This is usually required because of unusual sample constituency or some unexpected occurrence during routine processing of the sample. These minor deviations should be recorded on the "Minor Deviations from SOP"(SCA Form 6-2, Appendix A). This form may be included in the data package for the data associated with the minor deviation thus recorded. It is important to handle only minor deviations that have no major consequences to the quality of the data, otherwise, it should be treated as a corrective action as described above. Approval from the Laboratory Supervisor, Manager, or Director must be received and documented on the Form.

APPENDIX A

CORRECTIVE ACTION FORM

Tracking No. _____ - _____ - _____ Requested by: _____
Analysis Batch No. MM/DD/YY Date: _____

Failure Affects:	☐ QC	☐ Sample(s)

Batch or Sample No(s): _____

Reason for Corrective Action

Samples

☐ Spilled Sample	☐ Low Tracer Recovery	☐ High Tracer Recovery	☐ MDA
☐ High FWHM	☐ Instrument Failed	☐ Confirm Result	☐ Other (Explain)

_____

_____

QC Samples

☐ Lost Sample	☐ LC ☐ LD ☐ PB Tracer Recovery	☐ LCS Standard Recovery	☐ Suspect Result
☐ High FWHM	☐ Instrument Failure	☐ Contaminated Blank	☐ LD Did Not Duplicate
☐ MS Recovery	☐ Other (Explain)		

_____

_____

Corrective Action Requested

☐ Recount Sample	☐ Recount QC	☐ Recount Batch	☐ Reanalyze Sample
☐ Reanlayze Batch	☐ Cover in Case Narrative		

_____

_____

Corrective Action Approved By: _____ Date: _____
Laboratory Supervisor, Project Manager, Laboratory Manager, or QA Officer

Results of 1st Corrective Action:

☐ Failed	☐ Passed

Root Cause: _____

Corrective Action Completed (If Passed) (See next page, if failed):

_____ Date: _____
Laboratory Supervisor, Project Manager, Laboratory Manager, or QA Officer

Failed 1st Corrective Action:

Corrective Action Requested:

☐ Recount Sample ☐ Recount QC ☐ Recount Batch ☐ Reanalyze Sample

☐ Reanlayze Batch

2nd Corrective Action Approved: _____ Date: _____

Laboratory Supervisor, Project Manager, Laboratory Manager, or QA Officer

Results of 2nd Corrective Action:

☐ Failed ☐ Passed

Root Cause: _____

Corrective Action Completed:

_____ Date: _____

Laboratory Supervisor, Project Manager, Laboratory Manager, or QA Officer

CORRECTIVE ACTION GUIDANCE

COVER IN CASE NARRATIVE

	Failure to Meet RDL*	Laboratory Duplicate Criteria	Recount	Reanalysis
Sample	✔	✔	✔	✔
QC Sample	✔	✔	✔	✔
Batch			✔	✔

* As a result of insufficient sample.

CRITERIA FOR RECOUNT

	Failure to Meet RDL	Suspect Results	Instrument Failure
Sample	✔	✔	✔
QC Sample	✔	✔	✔
Batch			

CRITERIA FOR REANALYSIS

	Failure to Meet RDL	Sample Integrity	Tracer Recovery Criteria	Alpha Spec. FWHM	Blank Criteria	LCS Recovery	MS Recovery	Alpha Spec. Blank Recovery
Sample	✔	✔	✔	✔				
QC Sample	✔	✔	✔	✔				
Batch					✔	✔	✔	✔

SEE OTHER SIDE FOR EXPLANATION OF CRITERIA

BOA CRITERIA

Criterion	Requirement
Chemical Recovery	40% to 110%
Tracer Recovery	30% to 110%
LCS Recovery	75% to 125%
MS Recovery	60% to 140%
Alpha Spec. Tracer FWHM	≤100 keV
Duplicate	$\frac{S-D}{\sqrt{(\sigma_S)^2 + (\sigma_R)^2}} \leq 3$
Blank Criteria	•the MDA of the Batch Blank is less than or equal to the RDL unless all samples in the batch are positive, as defined by the Site; •if all sample results in the Batch are greater than the Required Detection Limit (RDL), then the Batch Blank MDA shall be less than the activity of the least active sample in the Batch of that sample; and •if all of the samples in the batch are less than the RDL, the activity of the Blank shall be less than or equal to the RDL.
Maximum Batch Size	20

Minor Deviations from Written Protocol

Date	Analyst	Deviation/Reason	SOP	Batch/Sample No.	Approved By

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FACILITIES, EQUIPMENT, AND MAINTENANCE

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1	1
2	1
3	3, 4
4	1, 2, 3, 4
5	Tables 7.2 & 7.3

7.0 FACILITIES, EQUIPMENT, AND MAINTENANCE

7.1 Facilities

The SC&A laboratory is designed specifically to perform radiochemical analyses. The laboratory was designed to accommodate the logical flow of the radioanalytical processes, to promote productivity, and to promote SC&A's absolute dedication to employee safety and environmental protection. A schematic of the laboratory is shown in the figure on page 5 and the area is allocated as listed below in Table 7-1.

Table 7-1. SC&A Laboratory Space Allocation

Space Description	Square Footage
Total Laboratory	2852
Sample Preparation	334
Sample Storage	389
Counting Room	270
Soils Laboratory	713
Chemistry Laboratory	618
Office and Other Space	528

The laboratory contains three six-foot fume hoods. All potentially contaminated discharges from the laboratory are collected in a 200-gal holding tanks and monitored prior to release to the sanitary sewer system. All acid discharges are neutralized and monitored prior to release and then passed through a neutralization system which is integral to the sanitary sewer system.

The radiochemistry laboratory has 110 linear feet of bench space with ample storage space and ventilated acid and organic chemical storage cabinets. Counter surfaces are constructed from impervious materials to reduce the potential of radiological contamination. The laboratory has a constant supply of deionized water.

The sample preparation area has 35 linear feet of bench space and contains the radiological fume hood, two vented drying ovens, and two furnaces.

Each of the two sections of the laboratory are on separate HVAC systems from the counting room/office area. This was instituted to minimize cross contamination and to protect equipment from corrosive fumes

7.2 Equipment

The counting room is equipped with state of the art low-level detection instrumentation as shown in Table 7-2. The Laboratory is secured by a 6 ft. chain link fence which can only be entered by employees with access keys. Visitors are only admitted access by escort.

7.3 Maintenance

The Laboratory facilities are maintained by the landlord from whom it is leased.

All measurement systems used in this project are owned and maintained by the SC&A and are located at the SC&A Southeastern Environmental Laboratory. Preventative and routine maintenance are performed on appropriate equipment under a maintenance contract with the manufacturer. Routine maintenance such as counting gas and liquid nitrogen replacement are provided by laboratory personnel on an as-needed basis. Additional maintenance items (not covered in other specific SOPs) are performed as listed on the schedule in Table 7-3.

7.4 EQUIPMENT

General Laboratory Equipment presently available at SC&A's Southeastern Environmental Laboratory is listed below The date acquired is included.

Table 7-2. General Laboratory Equipment

Equipment Description	Manufacture and Model	Date Acquired	Quantity
Analytical Balance	Mettler AG104	1995	1
	Denver Instrument XE-510	1995	1
	Denver Instrument XE-4100	1995	1
	OHAUS ARD110	2004	1
Distilled Water System	Barnstead	1995	1
Distiller	Barnstead	1999	1
Oven	Fisher Isotemp, Model 750F:		
	No. 1	2003	1
	No. 2	2004	1
Muffle Furnace	Fisher Isotemp: No. 1	1995	1
	No. 2	1999	1
Refrigerator/Freezer	Kelvinator	1998	1
Exhaust Hoods	Kewaune / Visionare	1995	2
	Hamilton/Safeaire	2002	1
Benches	Kewaune	1995	8
Radiation Survey Meters	Ludlum Model 3	1995	4
	Ludlum Model 16	1990	1
	Ludlum Model 19 No. 1	1995	1
	No.2	1999	1
	Ludlum Model 3-98	1995	1
Detectors	Ludlum Model 44-94 GM	1995	1
	Ludlum Model 44-40 GM	1995	2
	Ludlum Model 44-9 GM	1995	1
	Ludlum Model 43-2 Scint	1995	5
	Ludlum Model 43-90 Scint.	1995	1
	Ludlum Model 43-5 Scint	1995	1
	Ludlum Model 44-3 Scint.	1995	1
	Ludlum Model 44-2 Scint.	1995	1
	Ludlum Model 44-1 Scint.	1995	2
Microscope	Nikon,/ Optiphoto2-POL	1995	1
Sonicator	Transonic 1040/H	1995	1
Filter Press	Minpro	1995	2
Centrifuge	International Equip Co. No. 1	1995	1
	No 2	1995	1
	No. 3	2004	1
Deep Freezer	Frigidaire	2002	1

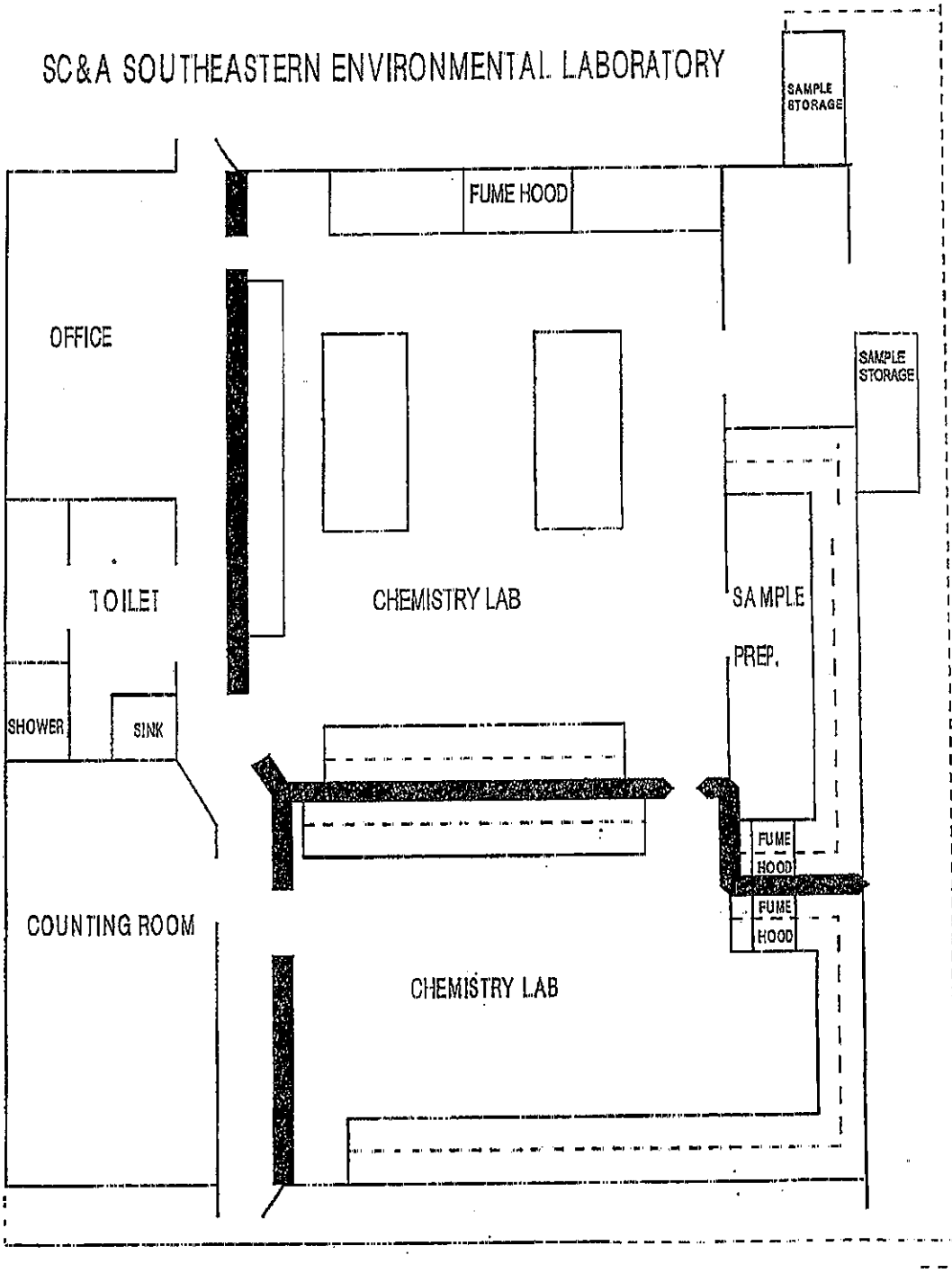
Radiation Counting Equipment presently available at SC&A's Southeastern Environmental Laboratory is listed below. The date acquired is included.

Table 7.3 Radiation Counting Equipment

Analysis	Equipment Description	Date Acquired	Quantity	Manufacture and Model
Gamma Spectroscopy	35% Ge Detector with Shield and Cryogenic Dewar: No. 1 No. 2 No. 3	 1995 1997 2003	3	Canberra
	Multichannel Analyzer	1995	1	Canberra Genie - ESP
	Gamma Spectroscopy Data Reduction Software	1999	1	Procount
Alpha Spectroscopy	Surface Barrier Alpha Spectrometer Detector Nos. 1-8 Nos. 9-16 Nos. 17-28 Nos. 29-40	 1995 1997 1999 2003	40	Canberra
	Alpha Management System Software	1999	1	Canberra
Gross Alpha/Beta Counts	Low-background proportional counter with four 2.5 in. detectors: Instrument No. 1 Instrument No. 2 & 3 Instrument No. 4 & 5	 1999 2001 2003	5	Protean
	Gross α/β counter software	1999	1	Protean
	Personal Computer	2003	1	Dell
Liquid Scint. Counter	Alpha-Beta Discrimination	1995	1	Packard
	Software	1995	1	IBM
Radium Counter	Scalers: Model 1000 Model 1000 Model 2000 Model 2200	 1996 1999 1999 1996	4	Ludlum Rocky Mountain
	Lucas Cells	1995- 2003	22	Ludlum, Rocky Mt.

Table 7-4. Maintenance Schedule

Item	Frequency
Clean Alpha Spec. Detectors	Monthly
Check and Refill Vacuum Pump	Monthly
Maintenance on Scales and Balances	Annually
Check Conductivity on DI Water	Daily
Refill HPGe Dewar	Weekly
Check Proportional Counter Gas	Weekly
Verify Operation of UPS	Daily


SC&A SOUTHEASTERN ENVIRONMENTAL LABORATORY
SAMPLE STORAGE
FUME HOOD
OFFICE
SAMPLE STORAGE
TOILET
CHEMISTRY LAB
SAMPLE PREP.
SHOWER
SINK
FUME HOOD
FUME HOOD
COUNTING ROOM
CHEMISTRY LAB

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INSTRUMENTATION AND CALIBRATION FREQUENCY

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4	1, 3
5	2
6	2
7	1

8.0 INSTRUMENTATION AND CALIBRATION FREQUENCY

To provide data of known quality it is imperative that instrumentation be calibrated against recognized standards in order to accurately identify radionuclides and measure their concentrations. Documentation of calibration results are maintained for each instrument. Instrument calibrations are verified by periodically ascertaining that measurements of secondary standards are within established control limits. The results of the comparisons are use to verify the calibration and ensure that instruments are operating correctly. The performance of calibration checks is documented and the results are stored electronically or in a log book. Any instrument that does not pass the calibration check is tagged "OUT OF CALIBRATION - DO NOT USE", and is removed from service for maintenance or recalibration. Standards used for calibration are traceable to the National Institute of Standards and Technology (NIST). Certifications of NIST traceability are maintained for all standards

Radiation detection and measurement instrumentation and the initial and continuing calibration frequencies are provided in the following table. The calibration procedures for all measurement systems used are contained in Section 13.0 - Standard Operating Procedures

Radiation Counting Instrumentation and Calibration Frequencies

Analysis	Equipment Description	Calibration SOP	Initial Calibration	Continuing Calibration
Gamma Spectroscopy	35% Ge Detector	SCA-402	Annually	Daily (as used)
Alpha Spectroscopy	Surface Barrier Alpha Spectroscopy Detector	SCA-401	Monthly	Daily (as used)
Alpha-Beta Proportional Counter	Low-background proportional counter with 2.5 in detector	SCA-404	Biennially[1]	Daily (as used)
Liquid Scintillation Counter	Alpha-Beta Discrimination	SCA-403	Each Batch	Daily (as used)

[1]Recalibration is required if there is evidence that a detector is out of calibration

The calibration due date is listed on each survey instrument using SCA Form 8-1. A table that lists the calibration due date for each instrument is posted on the instrument cabinet. The table is to be reviewed regularly to insure proper tagging by the technician of any instrument that has exceeded the required calibration date. The stringed tags are labeled, **"OUT OF CALIBRATION - DO NOT USE."**

When a counting instrument, as a result of the failure of the daily or other calibration check, is determined to be inoperable, the instrument is to be tagged, **"OUT OF CALIBRATION - DO NOT USE."**

8.1 DETECTOR CONTAMINATION CONTROL

Detectors and detector chambers that are directly exposed to the sample media during counting risk the possibility of becoming contaminated. This problem exists essentially during gross α/β measurements and alpha spectroscopy, as samples for liquid scintillation counting and gamma-ray spectroscopy are contained. This problem is especially acute following the counting of a relatively "hot" sample. The following procedure will be performed when this occurs.

8.1.1 After a contaminated sample is counted, a blank planchette is placed in the chamber and a short-term background is performed.

8.1.2 If the background is not elevated, normal operations may continue. If the background count indicates the presence of contamination in the detector chamber, the following steps are performed:

- the Laboratory Manager is notified,
- the detector is thoroughly cleaned using caution to not damage the detector window in the proportional counter or the surface-barrier detector in the alpha spectrometer,
- a soft-bristle brush, chem-wipe or clean soft-rag, and alcohol are used in the cleaning process.

8.1.3 A long-term (e.g. 24 hour) background is performed. If the background has returned to normal, the detector is returned to service. If the background remains elevated, the cleaning process is repeated until a normal background is achieved.

8.2 INITIAL CALIBRATION EVALUATION

When initial efficiency calibrations are performed on instrumentation and detectors, the results will be compared to the previous calibrations. If the results differ by more than ± 10%, unless otherwise specified in a 400 series SOP, an attempt will be made to determine the reason(s). The results of this evaluation will be documented. This does not apply to calibrations which are performed routinely for each batch and applied to only that batch.

APPENDIX A

SURVEY INSTRUMENT CALIBRATION DUE-DATES

Out of Cal.[a]	Instrument	Model	Serial No.	Radiation Type	Due Date
	Ludlum Survey Instrument Detector	3 44-94	124840 PR 126041	Beta/Gamma	
	Ludlum Survey Instrument Detector	3 43-90	123105 PR 127227	Alpha	
	Ludlum Survey Instrument Detector	3 43-2	56439 PR 057784	Alpha	
	Ludlum Survey Instrument Detector	3 44-9	120189 PR 067189	Beta/Gamma	
	Ludlum Survey Instrument	19	73514	Gamma	
	Ludlum Survey Instrument	19	51849	Gamma	
	Ludlum Survey Instrument Detector	16 43-5	56585 PR 067187	Alpha	

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SCA-Form 8-1 Rev 0

[a] When a calibration date is exceeded, check (X) this column and tag the instrument as "Out Of Calibration - DO NOT USE".

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DETECTION LIMITS

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2	All Pages

9.0 DETECTION LIMITS

9.1 Laboratory Detection Limits

Minimum detectable activities and concentrations for the methods and instruments to be used in this project are calculated as defined below.

Assuming that the number of background counts is a Poisson variate with an approximately normal distribution, and assuming that the background and gross counting times are not necessarily equal, the minimum detectable activity is:

$$MDA = \frac{z^2 + 2z\sqrt{[B_R\, t_g\, (1+\frac{t_g}{t_b})]}}{t_g \times E} = \frac{2.71 + 3.29\sqrt{[B_R\, t_g\, (1+\frac{t_g}{t_b})]}}{t_g \times E}$$

where :

B_R	=	the mean background count rate
t_g	=	the gross sample counting time in minutes
t_b	=	the background counting time
z	=	1.645 is the 95th percentile of the standard normal distribution.
E	=	the efficiency in counts per disintegration (cpm/dpm)

When the background and the sample are counted for the same amount of time, the equation for the minimum detectable concentration is:

$$MDC = \frac{2.71 + 4.65\sqrt{(B_R\, t)}}{2.22 \times t \times E \times V \times Y \times D}$$

where:

MDC	=	minimum detectable concentration (pCi/unit weight or pCi/unit volume
B_R	=	the mean background count rate
E	=	the efficiency in counts per disintegration (cpm/dpm)
t	=	sample and background counting time

V = sample volume
Y = chemical yield
D = decay correction factor

It has been reported that a more accurate representation of the MDC is:

$$MDC = \frac{3.0 + 4.65\sqrt{(B_R\ t)}}{2.22 \times t \times E \times V \times Y \times D}$$

When appropriate and possible (available in the instrumentation software) this alternative MDC can be applied.

9.2 Minimum Detection Limits

The MDC for a given sample is affected by not only the background count rate but by all the variable factors in the denominator of the above equation, namely, the efficiency, the count time, the sample volume, and the chemical yield. Of these, only the sample volume and count time are controllable. The following MDCs are given for reference and represent nominal values for volume, count time, efficiency, and chemical yield.

Table 9.1 Minimum Detection Limits for Liquids and Solids.

Analyte	Method(s)	Liquids Minimum Detectable Concentrations (pCi/L)	Solids Minimum Detectable Concentrations (pCi/g)
Gross Alpha	EPA 900.0	5	5
Gross Beta	EPA 900.0	3	3
Total Radium	EPA 903.3 SM 7500 Ra B	3	3
Tritium (H-3)	EPA 906.0	400	400

Analyte	Method(s)	Liquids Minimum Detectable Concentrations (pCi/L)	Solids Minimum Detectable Concentrations (pCi/g)
Carbon-14	Krieger	20	-
Cobalt-60	EPA 901.1	10	5
Ni-63	SCA-345	50	50
Zn-65	EPA 901.1	20	-
Strontium-89	Eichrom SRW01	2	2
Strontium-90	Eichrom SRW01	2	2
Technetium-99	Eichrom TSC01	10	15
Iodine-129	APHA 7500-1 B	5	5
Iodine-131	901.1	10	20
Cesium-137	901.1	7	3
Radium-226	EPA 901.1 EPA 903.1 SM 7500 Ra C	2	2
Radium-228	EPA 901.1 EPA 904.0	2	0.5
Thorium-228	Eichrom ACW03 00-05m	4	2
Thorium-230	Eichrom ACW03 00-05m	2	1
Thorium-232	Eichrom ACW03 00-05m	2	1
Uranium-234	Eichrom ACW03 SM 7500 U C(m) 00-05m	1	1

Analyte	Method(s)	Liquids Minimum Detectable Concentrations (pCi/L)	Solids Minimum Detectable Concentrations (pCi/g)
Uranium-235	Eichrom ACW03 SM 7500 U C(m) 00-05m	2	2
Uranium-238	Eichrom ACW03 SM 7500 U C(m) 00-05m	1	1
Neptunium-237		3	2
Americium-241	Eichrom ACW03	1	1
Plutonium-241	Eichrom ACW03	4	4
Plutonium-242	Eichrom ACW03	1	1
Plutonium-238	Eichrom ACW03	1	1
Plutonium-239/240	Eichrom ACW03	1	1
Curium-242	Eichrom ACW03	1	1
Curium-243/244	Eichrom ACW03	1	1
Curium-245-246	Eichrom ACW03	1	1

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DOCUMENT CONTROL, STORAGE, AND RETENTION

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1	1
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3	1

10.0 DOCUMENT CONTROL

The preparation, issue, and change of documents that specify quality requirements or prescribed activities affecting quality are controlled to assure that correct documents are being employed. Procedures, methods, and quality related documents are often revised. It is, therefore, essential that laboratory and project personnel maintain current copies of these documents. A document control system is maintained to ensure that current and revised documents are issued and distributed to appropriate personnel. All documents contained in the Southeastern Environmental Laboratory Quality Assurance Plan are "controlled documents"

A document control distribution list is maintained of personnel who have been issued controlled documents and assigning a unique document control number. When new documents are issued or revisions to existing documents are made, personnel named on the document control distribution list are issued the new or revised document. The title page of individual documents in the Laboratory Quality Assurance Plan will identify that the document is "controlled" and the document control number. Documents contained in the Laboratory Quality Assurance Plan may be provided as "uncontrolled documents" but will be marked "uncontrolled" and do not have document control numbers. SOP No. 102 describes the steps to be followed in order to maintain document control.

10.1 DOCUMENT STORAGE AND RETENTION

SC&A retains client data and records for a period of five (5) years, unless a longer period is negotiated (up to 10 years). At the end of the retention period, clients may opt to have the data and records returned to them or have SC&A shred and dispose of the data.

After generation and mailing of reports (including any electronic versions), client data are stored at the laboratory facility, after which it is delivered to a secured off-site storage facility for a period of five (5) years, or longer if required by the client. The data are securely packaged, dated, and stored in chronological order by project, month, date, and year. Other identifying information, such as SC&A numbers, allows packages to be retrieved with relative ease in the event customers have questions concerning data, validation, defensibility, etc., well after analyses have been completed. If fireproofing is required by the client, data are stored in fireproof safes and/or cabinets.

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SOFTWARE CONTROL AND COMPUTER BACKUP

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1	1
2	1, Form 11-1
3	2, Delete Form 11-1

11.0 SOFTWARE CONTROL

Software control assures that the working version of a software program/spreadsheet produces the same results as the original software program/spreadsheet. This assumes that the original versions were validated/tested before being branded original operating versions. Original versions of software are maintained in a separate computer directory. Working copies of software are maintained in their respective working directories.

Periodically software validation procedures are performed by means of in-use tests on computer programs/spreadsheets used for data entry or calculational purposes. Hand calculations are compared to electronically generated calculations from the original as well as the working versions. Acceptable performance of the computer program/spreadsheet in the operating system is verified. Validated software are assigned version numbers and version control is maintained by the Software Control Manager. A historical file of software revisions and associated validation documentation is maintained on each program. This historical file is maintained in chronological order.

11.1 COMPUTER BACKUP

Backups of the LIMS Database are performed daily. These backups are performed either through a software application or manually. Backups are stored on computer tape. Backup tapes are kept in a fireproof safe.

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DATA REVIEW AND REPORTING

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12.0 DATA REVIEW AND REPORTING

Upon arrival at the SC&A Laboratory each sample is identified by a unique sample number. For each sample, SC&A records the following items of information:

- Sample number
- Project code (prefix)
- Sample matrix
- Collection date(s) and time(s)
- Sampling location
- Date of receipt at SC&A
- Name of Project Coordinator (reportee)

For each radiochemical analysis, SC&A records the following information:

- Analysis type
- Analyst
- Counting system(s)
- Counting date(s), time(s), and duration(s)
- Verifier initials and verification dates
- Results

For each analytical result, the following information is recorded:

- Name of analyte
- Measured activity, concentration, or amount
- Estimated 2-sigma uncertainty of the measurement
- Units of measurement
- Effective date of measurement

It is SC&A policy to require two *independent* verifications of each radiochemical analysis performed. The first verification typically is done by a representative of the radioanalysis laboratory and the second by the Laboratory Manager or Project Manager to verify QA and contract compliance.

The signature of the verifier and the date of verification are recorded with each analysis. The first verification may be based on paper copies of the analysis results before they are stored in the database, but at least one verification must be based on the stored values. Unverified results must not be released.

All gamma and alpha spectroscopic analyses performed in the Counting Room must be verified first by an authorized representative of the Counting Room. The decision by the Counting Room Supervisor to reject an analysis cannot be reversed without a successful appeal to the Project Manager or the Quality Assurance Officer. Following an appeal, either the Laboratory Manager or the QA Officer may perform the required verification. This process could be documented.

When a printed report of the analytical results for a project is prepared, the Project Manager must review and approve all the data, including the results of QC analyses. The Project Manager or Laboratory Manager must approve any printed report before release. Analytical results, even "verified" results, must not be released to the client without approval from the Laboratory Director.

It is SC&A policy to compute and record all analytical results, whether positive, negative, or zero, along with the associated two-sigma measurement uncertainties. Negative values and their uncertainties may be included in data reports for scientific readers.

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MATERIAL PROCUREMENT AND CONTROL

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13.0 MATERIAL PROCUREMENT AND CONTROL

Material procurement and control include provisions for documenting and controlling procurement of materials, equipment, and supplies. Material procurement and control include maintaining an adequate inventory of supplies and ensuring that all supplies/equipment meet or exceed quality requirements. SOP No. 103 describes the steps to be followed in order to maintain control of quality related items.

The following are typical procurement requests.

a. radioactive standards
b. chemicals
c. gloves, lab coats, safety glasses
d. glassware, pipettes, balances, pH meters
e. filter paper
f. paper products

Upon receipt, an order is inspected to verify that the item(s) received satisfies the description and requirements provided on the purchase order. If any requirement is not satisfied, the requestor is consulted for approval. If the specifications are not satisfactory, the item is returned to the vendor. Procurement of radioactive materials requires coordination with the Radiation Safety Officer and the Laboratory Manager.

Approval of a vendor depends upon the vendors ability to supply reagents, chemicals, supplies, equipment, etc., at a fair price and in a timely manner, and meet the specifications required by SC&A's SOPs. The following items are useful in selecting an acceptable vendor.

Choose an appropriate vendor, considering the item needed and the vendor's ability to supply it to SC&A. Contact the vendor for the following information: credit application, method of payment, cost and any discounts available, shipping method, and type and availability of reagents, chemicals, supplies, equipment, etc. If the type and availability of reagents, chemicals, supplies, equipment, etc., can be met in a timely manner, if the vendor's method of payment meets SC&A's method of payment, if the shipping method is adequate for SC&A, and/or if a discount is applicable, setup an account by completing a credit application. Upon approval of the credit application, a vendor is approved. Long-

term use of the vendor depends upon pricing, timeliness of delivery, condition of supplies at arrival, and overall customer satisfaction with the vendor. This is decided by the Procurement Officer.